Edible Aquifer in a Cup

LESSON SUMMARY

In this lesson, students will create a model of a sand/gravel type aquifer. The benefit of this activity is that the model is accurate, but students are engaged due to the ice cream factor.

LESSON OBJECTIVE(S)

- Students will replicate a confined sand/gravel type aquifer.
- Students will replicate how pollution can enter confined aquifers.
- Students will experience how models help scientists understand phenomena that is difficult to observe due to it being underground.

FOCUS QUESTION

What is the structure of a confined aquifer and how does pollution enter it?

LEARNING TARGET (I CAN STATEMENT)

I can model a confined aquifer and show ways pollution can enter an aquifer.

STANDARDS ADDRESSED

AR: 6-ESS2-4/6-ESS3-3
MS: E.3.9.3/E.3.10.1/E.3.10.2/E.4.9A.1
TN: 3.ESS2.1

MATERIALS

- Vanilla Ice Cream (1 gallon does about 30 students)
- Ice
- Soda (2L bottle does about 30 students) (clear soda is easier to see, but brown soda works well too, and students prefer it)
- Grenadine
- Oreo Cookies
- 1 Per student:
    - Clear plastic cup (9oz size works well)
    - Spoon
    - Straw

PROCEDURES

1. Show students the diagram of an aquifer (attached). Explain that an aquifer is an area of rocks or sediments underground that holds groundwater. We use wells to access the water that humans use to drink, irrigate crops, etc. In geoscience we often use models to help us understand processes. In this activity they will be modeling an aquifer that they get to eat when they are done.
2. Give each student a cup, spoon, and straw.
3. Put ice in each student's cup (about halfway). Explain in our model that the ice is modeling sand and gravel. Sand and gravel are the water bearing (holds water) sediment in this aquifer.

PROCEDURES continued

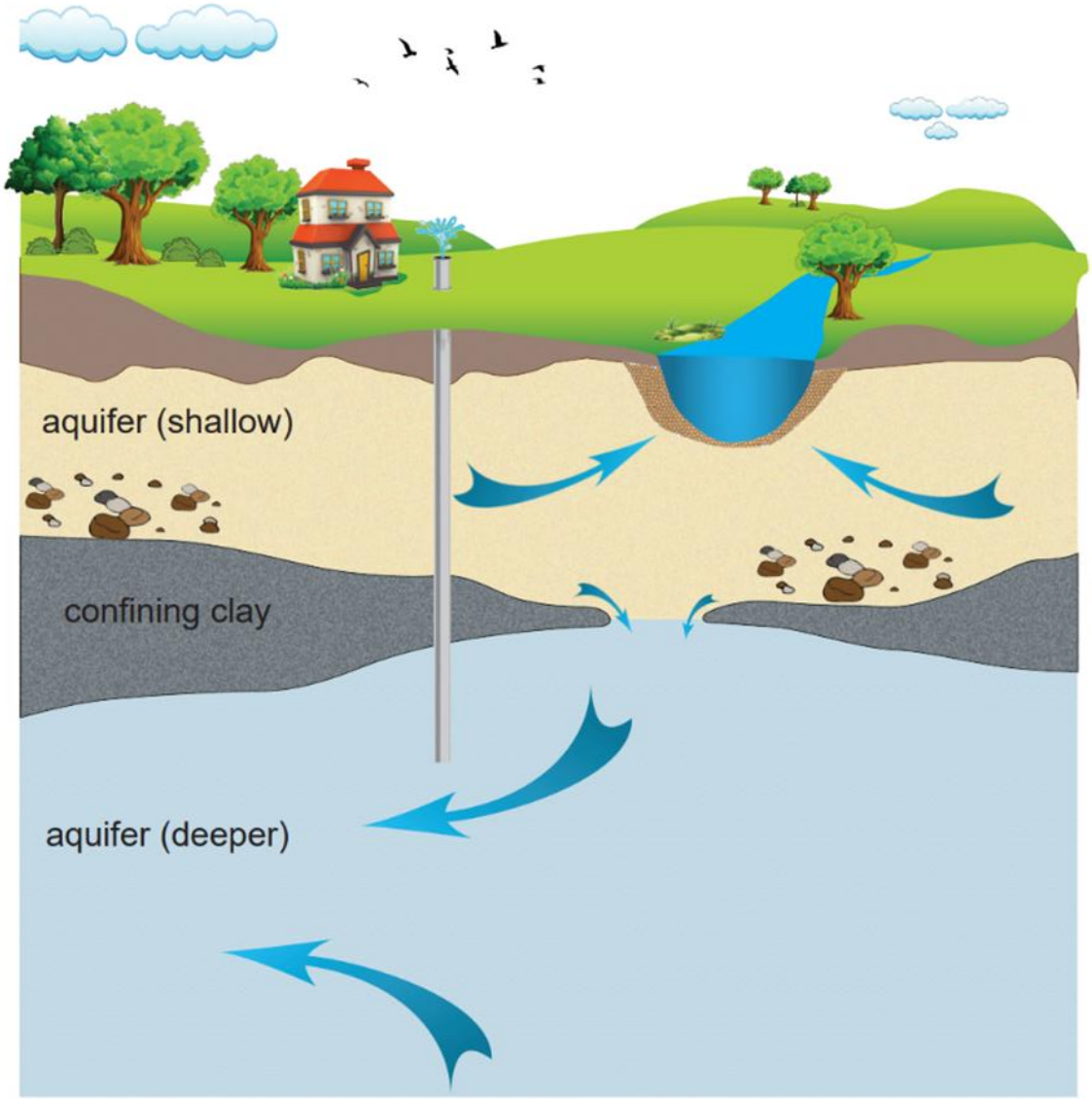
4. Add soda to each student's cup till it covers the ice. Explain the soda represents water in the model. At this point, the model shows an unconfined aquifer model. An unconfined aquifer is near the surface with only permeable (easily allows water and air through) soil on top of it.
5. Add a scoop of ice cream to each student's cup. Have students use the back of their spoon to smooth the ice cream over the entire surface of soda and ice. Explain the model we are making today is a confined aquifer. The ice cream represents an impermeable (does not easily allows water and air through) material like clay or rock. In the Mid-South area, it is clay.
6. Hand each student and Oreo cookie. Have them crumble it up and add it on top of the ice cream. Explain that the crumbled Oreo represents gravel and soil above the aquifer.
7. Explain to students they have a completed confined aquifer model now. In real life, to access an aquifer we drill wells. They are going to use their straw to represent a well. Have students stick the straw through all the layers. Let students take a sip from their aquifer. Tell them to remember how it tastes currently.
8. Explain to students confining layers have areas that are missing clay. They are called breaches, and they usually occur naturally, but can also be manmade (drilling wells, for example). What is happening on the surface interacts with what is happening underground. In our model we are going to have a chemical spill. The grenadine (or say cherry syrup) is going to represent chemicals. Go around to each student's cup and pour some grenadine around the straw and near where the Oreos meets the cup. Have students observe where the grenadine goes. It is bright enough in color they will be able to see it even in a brown soda like Coke.
9. Have students take a drink again. Ask if they taste a difference. Now you can have students eat their model while you do the closure.

CLOSURE

While students eat their model help lead a discussion of what they observed. Potential questions you could ask:

- Why did the soda taste different even though the grenadine was at the top?
- Could we take the grenadine back out of the soda? If so, how?
- Which model was easier to understand, the paper model or the edible model? Why?

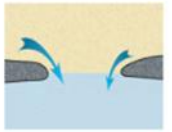
Have students write an exit ticket based on the lesson's focus question.



aquifer: allows for the storage and movement of LARGE amounts of water through sand

confining clay: very little water moves through the clay which acts to protect deeper aquifers from contamination

wells: drilled deep into the ground, a pump will bring water up to the surface



breach: naturally occurring holes in the confining clay that allows groundwater to move more easily between aquifers

Water in rivers moves very fast, like at speeds of 2 to 70 MPH or faster

Water in our local aquifers moves very slow at average speeds of 0.00001 MPH

CAESER
Center for Applied Earth Science and Engineering Research